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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,552	05/13/2004	Ching-Hua Chen	LKSP0033USA	3551

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EXAMINER

GEORGE, PATRICIA ANN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 02/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/709,552	CHEN ET AL.	
	Examiner	Art Unit	
	Patricia A. George	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,5-7 and 9-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7 and 9-15 is/are rejected.
- 7) ☒ Claim(s) 1,5 and 6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims fail to define what is encompassed by step (d).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (USPN 6,140,224) in view of Huang et al. of US 6,297,065, Kern (Handbook of Semiconductor Wafer Cleaning Technology - Science, Technology, and Applications; 1993; William Andrew Publishing/Noyes.), and Pintchovski et al. of USPN 4,822,753.

Lin discloses a method of forming a multiple barrier layers (fig. 9A, 30/28) on a substrate having at least a conducting layer (22) and having a plug (32) hole. The

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barrier (30/28), a Ti/TiN film (30/28 and fig. 9A, 28), as in claim 8, was formed by performing a chemical vapor deposition (CVD) process (col. 2, l.34), onto the substrate (20) and inner walls (see 28) of the plug (32) hole. Lin discloses the conducting layer is a polysilicon layer (fig. 9B, 22a), a silicide layer (22a "polysilicon" is written on silicide), and metal layer (fig. 9A, 22), as in claims 9-11.

Lin does not disclose performing an examination procedure, as in applicants' claim 1.

Huang teaches a method for detecting if a metal, such as Ti/TiN, layer is good, by examination procedure. If determined to be bad Huang teaches rework is preformed to remove the film, and afterward the film is re-deposited (see flow diagram).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to combine the steps of forming a barrier layer, as in Lin, with the steps of determining if the material is bad, removing the film, and then redepositing a good layer, as in Huang, because is well known and conventional industry practice to use reworking as means to cost savings.

The combined invention of Lin and Huang does not disclose performing an examination step, as in claim 1.

Kern teaches an examination method, defect detection and analysis (p. 604, Table 7.), which includes monitoring impurities (written on examine) for particle detection (section 4.6, para 2). Kern also teaches common wafer cleaning techniques (p. 417, Table 8.) such as: brush scrubbing the substrate to remove particles and

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rinsing with an aqueous sulfuric cleaning solution (p. 121, Table 2) such as a Piranha, a sulfuric acid solution (p. 121, Table 2.), as in claim 15.

It would have been obvious to one ordinary skill in the art at the time of invention was made, to include performing an examination step, as Huang, when forming Lin's barrier layer, because, detection of process induced particles, would signal the need to correct a production problem, resulting in increased yield, a known cost savings.

The combined invention of Lin does not disclose an etch step to remove the barrier layer, as in claim 1.

Pintchovski et al. teaches the method of making a contact, which includes an etching process that is wet (col. 4, l. 44-47) or dry etching process (col. 4, l. 41) (as in claim 12) to remove the barrier layer (fig. 5, 24). Pintchovski teaches any selective wet etchant can be used or etching can be by reactive ion etch.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the step of removing a barrier layer, as Pintchovski, when forming Lin's defective barrier layer because it is well known and conventional to rework a layer for cost savings.

Claim Rejections - 35 USC § 103

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (USPN 6,140,224) in view of and Cole et al. (USPN 5,338,975) in view of Kern

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(Handbook of Semiconductor Wafer Cleaning Technology - Science, Technology, and Applications; 1993; William Andrew Publishing/Noyes.) and Pintchovski et al. (USPN 4,822,753) in further view of Yamazaki et al. (USPN 6,613,614).

Although the modified teachings of Lin (USPN 6,140,224 see discussion above) do teach wet etching the buried layer, the teaching fails to include the specific wet etch chemistry defined in the applicant's claims 13 and 14.

As for claims 13, and 14, Yamazaki teaches a wet etching process comprising phosphoric acid (col. 2, l. 64), nitric acid (col. 2, l. 65), acetic acid (col. 2, l. 65) and water (col. 2, l. 65) where the ratio is 85:5:5:5. Yamazaki teaches a ratio of 42.5 of phosphoric acid where 38-41 is claimed. Yamazaki teaches 2.5 nitric acid to the claimed 1-1.5; 2.5 acetic acid to the claimed 1.8-2.1; and 2.5 water to the claimed 2.8-3.2. The applicant does not subscribe any criticality to the claimed ratio and the quantities and Yamazaki's teaching is within very close proximity to the claimed range. Comparison of the claimed amount to Yamazaki's amount shows no reason the solutions would function differently.

It would have been obvious to one ordinary skill in the art at the time of invention was made, to include the wet etch chemistry of Yamazaki in the modified teachings of Lin because Yamazaki teaches a formula that has known results of a high yield factor and excellent ohmic contact (col.3, l.8-9).

Allowable Subject Matter

The following is a statement of reasons for the indication of allowable subject matter: If the 112, 2nd claim rejection were overcome claims 1, 5, and 6 would be allowed.

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not disclose or suggest a method for forming a Ti/TiN barrier layer on a cobalt silicide, that includes steps to rework the layer using a wet etch step employing an acid solution comprising: phosphoric acid (H_3PO_4), nitric acid (HNO_3), acetic acid (CH_3COOH), and water (H_2O) wherein the ratio of phosphoric acid, nitric acid, acetic acid, and water in the acid solution is between (38-41) : (31-1.5) : (1.8-2.1) : (2.8-3.2); in conjunction with all other limitations in the claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Argument

The examiner agrees with applicants' argument that Cole does not specify a barrier layer of Ti/TiN.

As to applicants' argument about the difference between the claimed ratio and Yamazaki's ratio, is not sufficient to overcome the rejection because applicants do not subscribe criticality to claimed ratio, quantities, and that the solution would function differently as a result of such adjustments.

Applicants' argument prior art is backend processing, and claimed invention is front end processing is not commensurate with the scope of the claimed language.

Applicants' argument toward electrical function of metal layers is not commensurate with the scope of the claimed language, nor have applicant subscribed criticality to the reworking a material would function differently based on the electrical function of the material.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: USPN 5,885,900, USPN 6,368,410, and USPN 6,396,147, and USPN 5,338,975.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patty George whose telephone number is (571) 272-5955. The examiner can normally be reached on weekdays from 7:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

12/05
PAG

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER

A handwritten signature in black ink, appearing to be 'N' followed by a horizontal line and a small flourish.